

ABSTRACT

IDENTIFYING UNCORRECTABLE CODEWORDS IN A REED-SOLOMON DECODER FOR ERRORS AND ERASURES

In a Reed-Solomon decoder handling both errors and erasures, an uncorrectable codeword is identified when any one or more of six conditions (a) to (f) is satisfied:

- (a) no solution to key equation $\sigma(x)T(x) \equiv \omega(x) \bmod x^{2T}$;
- (b) $\deg \sigma(x) \neq \text{nerrors}$;
- (c) error and erasure locations coincide;
- (d) $\deg \omega(x) \geq \text{nerrors} + \text{nerasures}$;
- (e) $\text{nerasures} + 2 \cdot \text{nerrors} > 2T$; and
- (f) an error location has a zero correction magnitude.

Nerrors and nerasures represent, respectively, a number of errors and erasures, with respect to an error locator polynomial $\sigma(x)$ and an erasure locator polynomial $\Lambda(x)$, $2T$ is the strength of a Reed-Solomon code, $\omega(x)$ is an errata evaluator polynomial, and $T(x)$ is a modified syndrome polynomial. A detector circuit 300 comprises a logic unit 350 which tests for the conditions (a) to (g), and an indicator unit 360 which provides a corresponding output.

[Figure 2]